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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/942,519	08/29/2001	Teruaki Okino	4641-59018	9610

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KLARQUIST SPARKMAN, LLP
One World Trade Center, Suite 1600
121 S.W. Salmon Street
Portland, OR 97204

EXAMINER

NGUYEN, LAM S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 01/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/942,519

Applicant(s)

OKINO, TERUAKI

Examiner

LAM S NGUYEN

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-12, 14-22 is/are rejected.
- 7) ☒ Claim(s) 3 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

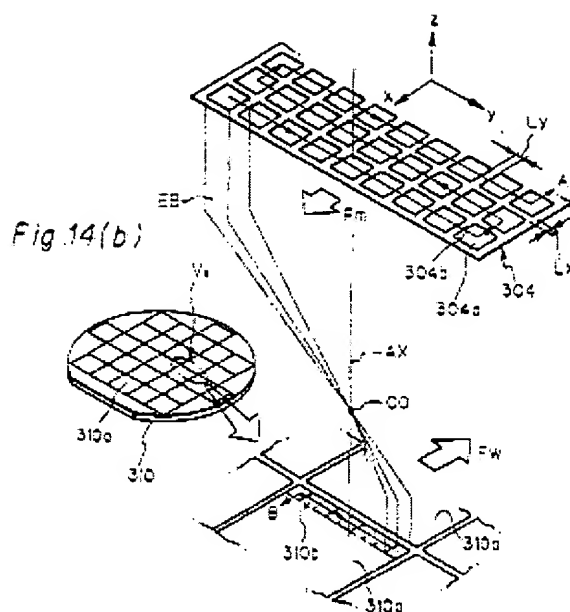
1. Claims 1, 2, 4-12, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji (US 5773837) in view of Suzuki (US 5994709).

Nakasuji discloses a method in a charged-particle-beam (CPB) microlithography in which a pattern is defined on a segmented reticle that is divided into multiple exposure units each defining a respective portion of the pattern that is transferred by a charged particle beam to a respective location in a die on a sensitive substrate, an improvement comprising:

arranging the exposure units (FIG. 14a, element 304a) on the reticle in a grid array extending in X and Y directions (FIG. 14a), the grid array including minor stripes (FIG. 14a, element 304b) each extending in the X direction and being arranged in the Y direction, each minor stripe comprising at least one exposure unit (FIG. 14a, element 304a);

successively deflecting a charged-particle illumination beam in the X direction to illuminate each exposure unit in each minor stripe and to illuminate the minor stripes in an ordered manner (FIG. 14a, the arrow A); and

Referring to claim 2: wherein the exposure units are respective subfields and each minor stripe comprises multiple respective subfields (FIG. 14a: a row of subfields 304a).



Referring to claim 10: wherein each region comprises multiple respective minor stripes, and each minor stripe comprises multiple respective exposure units; and during exposure of each region the illumination beam is deflected in the X direction to illuminate each respective exposure unit in a minor stripe and in the Y direction to progress from one minor stripe to another in the region (FIG. 14a).

Referring to claims 11, 16: wherein during exposure of the pattern, progression from one region on the reticle to the next is achieved by moving the reticle in the Y direction (FIG. 14a: the reticle 304 moves in the F_m direction).

Referring to claims 17, 18: an illumination-optical system (FIG. 10, element 302) configured to direct an illumination beam from a source to the reticle (FIG. 10, element 304);

a reticle stage situated downstream of the illumination-optical system and configured to hold the reticle (FIG. 10, element 328);

a projection-optical system (FIG. 10, elements 307, 308) situated downstream of the reticle stage and configured to direct a patterned beam from the reticle to the substrate (FIG. 10, element 310);

a wafer stage situated downstream of the projection-optical system and configured to hold the substrate during exposure of the substrate (FIG. 10, element 309); and

a main controller (FIG. 10, element 320) connected to the illumination-optical system, the reticle stage, the projection-optical system, and the wafer stage, the main controller being configured to (i) control transfer of the pattern from the reticle to a substrate mounted to the wafer stage, (ii) successively deflect the illumination beam in an X direction to illuminate each exposure unit in each minor stripe and to illuminate the minor stripes in an ordered manner.

Nakasuji does not disclose wherein the reticle includes multiple regions that are individually sequential transferred to the die (**Referring to claims 4-9, 14, 15**), each region on the reticle including one or more minor stripes illuminated multiple times such that the respective exposure units are illuminated multiple times by the illumination beam and transferred to the respective locations in the die on the substrate.

However, Suzuki discloses wherein the reticle includes multiple regions that are individually sequential transferred to the die (FIG. 14a: each die 310a is corresponding to a region including multiple row of element 304a), each region on the reticle including one or more minor stripes illuminated multiple times such that the respective exposure units are illuminated multiple times by the illumination beam and transferred to the respective locations in the die on the substrate (column 6, line 33-35: a mask-subfield pattern can be illuminated multiple times per die).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to replace the one-time illumination one or more minor stripes as disclosed by Nakasuji by multiple-times illuminating as disclosed by Suzuki. The motivation of doing so is to provide a charged-particle beam exposure apparatus that can perform projection exposure of mask subfields onto corresponding transfer subfields on the wafer such that the transfer subfields are properly stitched together without generating third-order deflection aberration as taught by Suzuki (column 3, line 5-10).

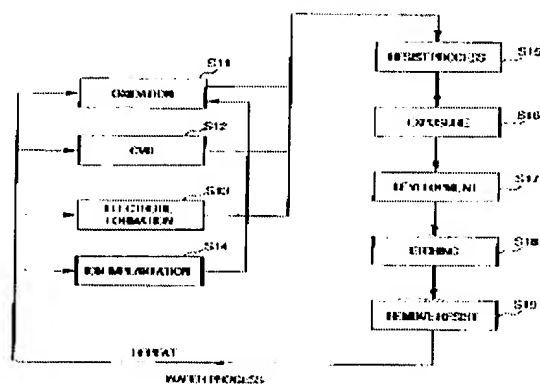
2. Claims 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muraki (US 6274877) in view of Nakasuji (US 5773837) and further in view of Suzuki (US 5994709).

Muraki disclose a method for manufacturing a microelectronic device, comprising:

- (a) preparing a wafer (FIG. 12, steps S1-S3);
- (b) processing the wafer (FIG. 13); and
- (c) assembling devices formed on the wafer during steps (a) and (b),

wherein step (b) comprises the steps of (i) applying a resist to the wafer (FIG. 13, step 15); (ii) exposing the resist (FIG. 13, step 16); and (iii) developing the resist (FIG. 13, step 17).

FIG. 13



Muraki does not disclose that step (ii) is performed using a CPB microlithography apparatus.

However, Nakasuji and Suzuki disclose a microthography apparatus employing a charged-particle beam for exposure of a mask pattern onto a sensitive substrate as used in manufacturing semiconductor devices (US 5994709: column 1, line 5-10).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to use the CPB microlithography apparatus as disclosed by Nakasuji in view of Suzuki to perform the exposing the resist in the wafer process disclosed by Muraki. The motivation of doing so is to achieve high exposure resolution and high throughput as taught by Suzuki (column 1, line 11-15).

Allowable Subject Matter

2. Claims 3, 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The most pertinent arts Nakasuji (US 5773837) in view of Suzuki (US 5994709) fail to disclose wherein each minor stripe in the region is illuminated each of n times by the illumination beam at an illumination-dose that is $1/n$ times the illumination-dose that otherwise would be received by the minor stripe if the minor stripe were illuminated only once. Therefore, the claimed invention is not disclosed by the prior arts.

Conclusion

Art Unit: 2853

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


Mizuno (US 2001/0017355 A1) teaches an electron beam lithography apparatus including a control device in which, for each column stripe in each drawing time of multiple drawing, optional conditions of dividing a pattern to be drawn on the sample can be set; and a time obtained by dividing a total irradiation time by the number of total drawing times is set to an electron beam irradiation time (Abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN E BARLOW can be reached on (703)308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-3431 for regular communications and (703)305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN
January 7, 2003


John Barlow
Supervisory Patent Examiner
Technology Center 2800